A Rubella Vaccination Program for Women Entering the U.S. Army

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BECAUSE OF THE INCREASED NUMBER of women entering the Army, in 1975 the Surgeon General of the Army initiated a rubella vaccination program for all women in basic training. Rubella epidemics have been common on basic training posts, and it was feared that they would occur among female trainees just as they had among male trainees. Vaccination of all men in basic training was started on a year-round basis on October 1, 1976. The numbers of cases among male basic trainees from 1974 through 1977 at Fort Jackson, S.C., were as follows:

Year	*Number of cases*	*Rate per 1,000 per year*
1974	461	70.6
1975	307	46.5
1976	141	20.9
1977	119	17.9

Male trainees with rubella missed an average of 3 days of training time. Thus, a significant loss of training time could result from a rubella epidemic, and the rubella vaccination program was initiated not only to reduce the incidence of congenital rubella syndrome but also to lessen its occurrence among female trainees.

Setting

Fort Jackson is a 52,596-acre U.S. Army Training Center in the southeastern portion of Columbia, the capital and largest city in South Carolina. In 1977, the post had an average military population of 19,048; an average of 12,569 of these were trainees, 9,976 men and 2,593 women. A total of 69,407 (56,765 men and 12,642 women) trained at the post in fiscal year 1977 —October 1, 1976–September 30, 1977.

Until September 1977, male and female basic trainees had little opportunity to intermingle. Training was segregated; men and women had separate classrooms, mess halls, and sick call. Since that time, men and women have been training together; however, sick call and sleeping quarters are still segregated.

Materials and Methods

Within their first 3 days on the post, blood samples were drawn from all women entering basic training at Fort Jackson after April 21, 1975. Their serums were tested for hemagglutination inhibition antibodies (HIA); those with titers of 1:10 or less were considered to be nonimmune. A clinic, staffed by a nurse, was held once a week for nonimmune women. These women were counseled regarding the risks and benefits of the vaccine, and they were offered the option of accepting or rejecting the vaccine. Those who did not want the vaccine signed a refusal form; those who wanted it signed a consent form. Each woman was counseled about the need to avoid pregnancy for 2 months after vaccination, and if she met certain criteria, she was vaccinated immediately with HPV77DE5 rubella vaccine. The criteria used for giving or withholding the vaccine underwent the following three changes over the years.

Period 1—April 21, 1975, to January 31, 1976: Women were given the vaccine if (*a*) they had regular menstrual periods and were using an acceptable (IUD or the pill) birth control method or (*b*) they had had a tubal ligation or hysterectomy.

Women who had irregular or missed menstrual

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periods or used no acceptable form of birth control were referred to an obstetrics-gynecology nurse practitioner for pregnancy determination. Those who were determined to be not pregnant and were willing to use birth control methods were given the vaccine.

Period 2—February 1, 1976, to July 31, 1977: All nonimmune women were given a urine test for pregnancy. They were given the vaccine if (*a*) the urine pregnancy test was negative and if they used an acceptable form of birth control—IUD, the pill, or abstinence—or (*b*) they had had a tubal ligation or hysterectomy.

Women who had a positive urine pregnancy test or had a positive history for pregnancy were referred to an obstetrics-gynecology nurse practitioner for pregnancy determination. Those who were determined to be not pregnant and used an acceptable form of birth control were given the vaccine.

Period 3—August 1 to December 31, 1977: The criteria for giving or withholding the vaccine were the same as those for period 2, except that a blood pregnancy test replaced the urine pregnancy test. Serum for the pregnancy test was obtained at the same time that serum for the HIA titer was obtained.

Records were kept on the number of women tested, nonimmune, vaccinated, refused vaccination, pregnant, no shows for the counseling clinic, and discharged from the Army before completing the necessary screening process. The percentages of those who were immunized and those who completed screening were used as a measure of the effectiveness of the program. The percentage who completed screening was calculated by subtracting the number of no shows from the number of nonimmunes and dividing by the number of nonimmunes.

All women vaccinated for rubella from July 27 to December 5, 1977, were asked what kind of birth control method they had used since they entered the Army.

Beginning on August 1, 1977, all women entering basic training at Fort Jackson received a blood pregnancy test.

Cases of rubella were tabulated daily from hospital admission records and outpatient clinic records. Criteria for diagnosis were a combination of typical rash with any of the following: conjunctivitis, coryza, postauricular or post-occipital adenopathy, fever, or arthralgia.

The number of man-hours needed to accomplish the screening program during period 3 was estimated. The manpower needed for drawing blood was not included because all soldiers entering basic training have blood drawn for blood typing. The additional two tubes needed from the women would result in only a marginal increase in manpower. Similarly, the manpower needed when women were referred to the Obstetrics-Gynecology Clinic because of suspected pregnancy was not included. Because the blood pregnancy test had a very low false-positive rate, 90 to 95 percent of the women referred were truly pregnant, and they would have needed the clinic's services even in the absence of the screening program.

Results

A total of 29,852 women were tested for rubella titers between April 21, 1975, and December 31, 1977; 6,167 (21 percent) were found to be nonimmune, and only 9 percent of these refused vaccination (table 1). An average of 53 percent of the nonimmune women were

Table 1. Results of rubella vaccination program for female basic trainees, Fort Jackson, S.C., during 3 periods from 1975 through 1977[1]

Results	Period 1		Period 2		Period 3		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Number tested	9,703	...	15,223	...	4,926	...	29,852	...
Nonimmune	1,708	18.0	3,410	22.0	1,049	21.0	6,167	21.0
Completed screening	788	46.0	2,502	73.0	789	75.0	4,079	66.0
Vaccinated	523	31.0	2,038	60.0	704	67.0	3,265	53.0
Refused vaccine	185	11.0	311	9.0	47	4.4	543	9.0
Discharged from Army	63	3.0	107	3.0	7	0.6	177	3.0
No shows	920	54.0	908	26.9	260	25.0	2,088	33.8
Pregnant	7	0.4	41	1.0	31	3.0	79	1.0
Contracted rubella	10	0.6	5	0.1	0	0	15	0.2

[1] Period 1—Apr. 21, 1975–Jan. 31, 1976; period 2—Feb. 1, 1976–July 31, 1977; period 3—Aug. 1–Dec. 31, 1977.

vaccinated, and an average of 66 percent of these completed the screening process.

From July 27 to December 5, 1977, 80 percent of the women were using abstinence for birth control (table 2). An HCG blood pregnancy test was given to 4,926 basic trainees between August 1 and December 31, 1977; 115 (2.3 percent) were found to be pregnant.

Despite the vaccination program, rubella epidemics occurred among the female trainees in 1975, 1976, and 1977 (table 3).

Rubella titer and pregnancy test results were available 1 to 2 weeks after blood samples were drawn; these tests required 8 and 20 person-hours per week respectively. An average of 224 serums were screened weekly. Clinic sessions averaged 3 hours of nurse time per week; an average of 28 women attended each clinic. Vaccination required 1½ hours a week of medic time to vaccinate an average of 25 women a week. Clerk time averaged 2 hours a week to handle paperwork and clinic scheduling for an average of 45 women a week.

Table 2. Methods of birth control used by female basic trainees before receiving rubella vaccination, July 27–December 5, 1977

Method	Trainees	
	Number	Percent
Pills	162	16.0
IUD	16	1.6
Tubal ligation	7	0.7
Hysterectomy	7	0.7
Diaphragm	8	0.8
Abstinence	821	80.0
Total	1,021	99.8

Table 3. Cases of rubella among female basic trainees, by year and rate per 1,000 per year

Year	Number of cases	Rate
1974	72	45.1
1975[1]	122	77.3
1976	75	42.9
1977	119	68.5

[1] Rubella vaccination for female basic trainees was initiated on a year-round basis on April 21, 1975.

Discussion

Seventy-nine percent of the female basic trainees were found to be immune to rubella. This finding is in contrast to that for male basic trainees, who had been found to have an immunity level of 90 to 96 percent (*1*). The percentage is also lower than the 86 percent found for women aged 20–24 years in surveys by the Center for Disease Control (*2*). (The average age of female basic trainees is 20.3 years.)

These differences in immunity levels may be explained by the geographic differences in such levels in the United States or perhaps by the greater percentage of foreign-born women in the Fort Jackson survey.

The rubella vaccination program was most successful when blood samples for titer and pregnancy testing were obtained simultaneously, before the clinic was held. This procedure reduced the number of referrals to the Obstetrics-Gynecology Clinic, as well as the number of training days women lost when pregnancy

testing was done on a separate day. Administration of rubella vaccine immediately after the clinic was held also helped to maximize the number of women vaccinated.

The methods of birth control differed substantially from those reported in a study by Halstead and associates (*3*); 70 percent of their study group were using pills, IUDs, foam with condoms, diaphragms with contraceptive creams or jellies, or had had a tubal ligation. Many of the Fort Jackson women stated that they had discontinued birth control when they entered the Army because they did not expect to have an opportunity for sexual contact during basic training.

Herd immunity did not protect the nonimmune women from contracting rubella, according to the findings reported elsewhere (*4–9*) and the experience at Fort Jackson. A significant number of women are still nonimmune to rubella. These include women who were vaccinated but did not develop immunity, women who developed immunity which later waned, women from lower income groups who were missed in vaccination programs, and women who immigrated to the United States from countries having little rubella experience or no rubella immunization programs, or both.

Schoenbaum and associates (*10*), in their benefit cost analysis of various rubella vaccination policies, concluded that the economic benefits of rubella vaccination are greater if vaccine is offered once to age-12 females. However, if less than 100 percent of the target group accepts vaccination, the least number of babies with congenital rubella syndrome will be born if vaccination is offered twice, once to both sexes at age 2 and again at age 12 to females only.

To reduce morbidity and the risk of congenital rubella syndrome, testing of rubella titers and immunization of susceptibles should be considered for all women regardless of whether they had been vaccinated earlier. Most authors recommend that this be done before puberty to avoid the expense of ruling out pregnancy. Nevertheless, programs for women are feasible and practical in situations where they can be screened, counseled, and vaccinated en masse.

References

1. Vaeth, S. E., et al.: Rubella among Puerto Rican basic trainees. Milit Med 142: 539–541 (1977).
2. Center for Disease Control: Rubella surveillance, July 1973–December 1975. Atlanta, Ga., August 1976.
3. Halstead, E., et al.: Rubella vaccination fertility control in a large scale vaccination program for postpubertal women. Am J Obstet Gynecol 121: 1089–1094 (1975).
4. Horstmann, D. M.: Controlling rubella: Problems and perspectives. Ann Intern Med 83: 412–417 (1975).
5. Siegel, M.: Unresolved issues in the first five years of the rubella immunization program. Am J Obstet Gynec 124: 327–332 (1976).
6. Fox, J. P., et al.: Herd immunity: Basic coverage and relevance to public health immunization practices. Am J Epidemiol 94: 179–189 (1971).
7. Klech, L. E., and Rachelefsky, G. S.: Failure of rubella herd immunity during an epidemic. N Engl J Med 288: 69–72 (1973).
8. Lehane, D. E., Newberg, N. R., and Beam, W. E., Jr.: Evaluation of rubella herd immunity during an epidemic. JAMA 213: 2236–2239 (1970).
9. Pollard, R. B., and Edwards, E. A.: Epidemiologic survey of rubella on a military recruit population. Am J Epidemiol 101: 431–437 (1975).
10. Schoenbaum, S. E., et al.: Benefit cost analysis of rubella vaccination policy. N Engl J Med 294: 306–310 (1976).

SYNOPSIS

VAETH, STEPHAN, J. (U.S. Army Medical Department Activity): *A rubella vaccination program for women entering the U.S. Army. Public Health Reports, Vol. 94, November–December 1979, pp. 564–567.*

A voluntary rubella vaccination program for female basic trainees was initiated on April 21, 1975, at Fort Jackson, S.C. A total of 29,852 women were tested for rubella titers between April 21, 1975, and December 31, 1977, and 6,167 were found to be nonimmune. An average of 53 percent of the susceptible women were vaccinated. The best results were obtained from August 1 to December 31, 1977, when 67 percent of the susceptible women were vaccinated. During this period, blood specimens for rubella titer and for pregnancy testing were obtained simultaneously. This procedure reduced the number of referrals to the Obstetrics-Gynecology Clinic, as well as the amount of training time lost when pregnancy testing and rubella titer testing were done on separate days. Despite the vaccination program, however, rubella epidemics occurred among female trainees at Fort Jackson in 1975, 1976, and 1977.

A significant number of women are still susceptible to rubella. To reduce morbidity and the risk of congenital rubella syndrome, rubella titer testing and immunization of susceptibles should be considered for women—especially where they can be screened, counseled, and vaccinated en masse.